

## **REMARKS**

Claims 1-4, 6, and 17-20 are pending. Claims 7-16 and 22 are withdrawn.

### **Information Disclosure Statement**

The Office Action stated, "Applicant is required to submit a copy of JP 3213291 reference with [an] English translation (at least [an] abstract) when respond to this Office Action."

JP 3213291 is a Japanese Patent having the publication, JP 2001-015929. JP 2001-015929 was submitted with an English abstract on May 30, 2006. In accordance with 37 C.F.R. §1.98(a)(2), an English translation of JP 3213291 is presented concurrently herein. It is respectfully requested that the Examiner provide the Applicants with an initialed copy of the IDS indicating that each of the prior art references cited therein, including JP 3213291 have been considered and made of record.

### **Claim Rejection under 35 U.S.C. § 103(a)**

Claims 1-4, 6, and 17-20 were rejected under 35 U.S.C. §103 as being unpatentable over Zussman in view of Berger further in view of Hayashi and Farquhar. On page 4, the Office Action states, "Zussman teaches the present invention but is silent about the water absorption of the insulating resin layer [that] is equal to or less than 0.1% and the surface roughness of the patterned connecting line." On page 5, the Office Action states, "The prior art [is] silent about the surface roughness of the connecting lines. Since [the] Applicant has not stated [that] the less than or equal to 1  $\mu\text{m}$  surface roughness is for any particular purpose, the Examiner is taking the position that a surface roughness outside of this limitation would perform the same job."

Zussman, Berger, Hayashi, and Farquhar do not disclose or suggest the claimed surface roughness.

Independent claims 1 and 17 require, "...wherein surface roughness Ra of said patterned interconnect line is equal to or less than 1  $\mu\text{m}$ ." The present application, for example, states on pg. 8, lines 9-19:

The present invention may include the configuration, in which the surface roughness Ra of the patterned interconnect line is equal to or less than 1  $\mu\text{m}$ . Having this range of the surface roughness, the influence due to the skin effect thereof is eliminated, and the module having improved high frequency performance can be presented. For example, when copper is employed for the material for the interconnect line, the skin depth at 1 GHz is about 2  $\mu\text{m}$ . Thus, **providing the surface roughness Ra of the patterned interconnect line of equal to or less than 1  $\mu\text{m}$  effectively improves the high frequency performance** (*emphasis added*).

None of the cited references, individually or combined, suggest the unexpected improvement in high frequency performance provided by the claimed semiconductor device.

On page 5, the Office Action states, "The Examiner is taking the position [that] surface roughness of a connecting line can easily be determined and modified by well known methods such as etching, electrolytic plating, pressing, etc. Determining a workable connecting line surface roughness for the invention involves only routine experimentations."

The "routine experimentation" basis for an obviousness rejection can only be relied upon by the Examiner if the *prior art* first recognizes the modified parameter as a result-effective variable. In the instant case, only the Applicants have recognized and considered the importance of the claimed surface roughness as a result-effective variable, so that the Examiner can not rely on the obviousness-theory of "routine experimentation" as a basis for asserting obviousness thereof. The Examiner is directed to MPEP § 2144.05(II)(B) under the heading "Only Result-Effective Variables Can Be Optimized", which sets forth the applicable standard for determining result-effective variables:

A particular parameter must first ***be recognized*** as a result-effective variable, i.e., a variable which achieves a recognized result, before the determination of the

optimum or workable ranges of said variable might be characterized as routine experimentation. (citing *In re Antonie*, 195 USPQ 6 (CCPA 1977)).

In the instant case, the cited references are completely silent to the surface roughness of the alleged patterned interconnect line in order to achieve a recognized result (indeed, the Examiner does not reference *any* portion of the cited prior art for this purpose); so that there is no basis for alleging obviousness thereof based on routine experimentation.

Further, the present application, for example, states on pg. 22, lines 12-31:

When the copper-plated layer is formed, the conditions for the formation thereof may be controlled so as to provide a desired level of the surface roughness or surface morphology, and further improve the adhesiveness thereof with the interlayer insulating film that will be formed later. For example, when the electroless plating is conducted, an additive agent may be added to the plating solution, and thereafter the electrolytic plating is conducted with pulsed electric current at a predetermined condition, and then the surface thereof is treated with a chemical solution to form a concavo-convex surface of the fine copper particles on the smooth surface thereof. This provides improved adhesiveness of the surface with the interlayer insulating film. In order to preferably form the concavo-convex surface of the fine copper particles, it is preferable to form the reduced grain size of the copper particles and create the random orientation of the crystalline axis of the copper grain during the electroless plating. The concavity and convexity of the copper-plated layer surface formed by the similar method to this embodiment is measured, and the result is about 0.8  $\mu\text{m}$ .

Accordingly, it is respectfully submitted that the claimed surface roughness would not have been obvious in view of routine experimentation because the cited references do not recognize surface roughness of the patterned interconnect line, *in the particular combinational structure set forth in the claims 1 and 17*, as achieving a recognized result.

None of the references cited, individually or combined, suggest "...wherein surface roughness Ra of said patterned interconnect line is equal to or less than 1  $\mu\text{m}$ ."

Withdrawal of the foregoing rejections is respectfully requested.

**Conclusion**

To the extent necessary, a petition for an extension of time under 37 C.F.R. 1.136 is hereby made. Please charge any shortage in fees due in connection with the filing of this paper, including extension of time fees, to Deposit Account 500417 and please credit any excess fees to such deposit account.

Respectfully submitted,

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